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Creativity and domain specificity: The effect of task type on multiple indexes of creative problem-solving

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Abstract

The study addresses the issue of domain specificity within creativity by understanding the characteristics of creative tasks and how participants react to the task. One hundred and eighty seven participants were given one of three realistic everyday problems to solve. The problems differed in terms of complexity, involvement, and problem-based efficacy. Problem solutions were evaluated on several measures of creativity. Results indicate that creativity was influenced by the type of problem solved and the measure of creativity used to evaluate the solution. Further, these results were obtained after controlling for the effect of ability. Results imply that not all real-world problems are equivalent and that researchers need to investigate how reactions to different problems and the creativity index used may influence conclusions regarding creative problem-solving.

Creativity and domain specificity: The effect of task type on multiple indices of creative problem-solving

In recent years, an important question has emerged for those interested in creativity and creative problem-solving: Is creativity general or domain specific? The domain specific approach suggests that creativity among individuals is specific to a certain field, whereas the general approach suggests that creative individuals can be creative in many domains (Baer, 1993; Baer & Kaufman, 2005; Plucker, 2005). Early studies of creativity focused on understanding eminent individuals, those who have achieved fame or recognition in their field. Few eminent individuals have shown achievement in more than one domain, suggesting that creativity is domain specific (Weisberg, 1999). Weisberg suggested that this is a result of the expertise required to achieve eminence. However, others have suggested that in order to determine whether creativity is domain specific or general everyday types of creative activities need to be evaluated (Kaufman & Baer, 2004). Supporting the domain generality approach, Plucker and Beghetto (2004) argued that cognitive processes related to creative problem-solving are general in nature, and are merely applied to domain specific knowledge or content.

Empirical studies provide support for both points of view. In support of the general approach, studies investigating personality characteristics of creative individuals have often identified personality variables, such as openness to experience, that differentiate creative individuals from those that are not creative and are consistent across domains (Feist, 1998). However, it is important to note that Feist has also identified some personality characteristics that differentiate between creative scientists and creative artists, lending support to the domain specific approach. Additional support for the

domain specific approach can be found in the research by Conti, Coon, and Amabile (1996), examining performance on everyday creative activities. Conti et al. found moderate to high intercorrelations between tasks within the same domain (writing stories on different topics), whereas the correlations between different domains were lower.

Baer (1996) investigated the effect of training middle school students in poetry relevant divergent thinking skills. Results of the study indicated that the training had a significantly greater impact on poetry writing than on story writing. Similarly, Baer (1993) in a series of studies investigating the relationship between various tests of creativity within and across domains, found only low to modest relationships, even within similar domains (for example, writing stories and writing poetry). Finally, Mumford, Marks, Connelly, Zaccaro, and Johnson (1998) found in a study of military officers that domain specific divergent thinking tests were good predictors of performance even when intelligence and expertise were taken into account.

It can be argued that these different findings are a result of the different tasks used to evaluate creativity. However, research suggests that even when similar tasks are used, such as divergent thinking tasks, differences between tasks may exist. The study by Mumford et al. (1998) suggested that divergent thinking tests designed for the specific area of expertise may be a better predictor of job performance than general divergent thinking tests. Additionally, Runco, Illies, and Eisenman (2005) found that when participants were asked to generate ideas for a realistic divergent thinking task (being invited to an attractive activity while needing to complete work) they generated more appropriate ideas, fewer original ideas, and showed less fluency and less flexibility than

participants that generated ideas to a less realistic divergent thinking task (uses for a brick).

Runco et al. (2005) hypothesized that the differences observed between the tasks are a result of the realistic nature of the task, and possibly the fact that participants may have had experience dealing with similar types of situations. Participants were able to draw on those experiences when responding to the realistic divergent thinking test, and as a result did not need to rely on their creative ideational skills, reporting only those ideas that they have thought of before. Similarly, Mumford et al. (1998) indicated that expertise plays an important role in creative problem-solving and that when tasks reflect the domain of expertise, better prediction results. In addition, Runco et al. suggested that it is possible that realistic tasks are more constraining since they imply that the response needs to be more realistic (more appropriate and feasible). This approach is supported by Yuan and Zhou (2002), who suggested that when tasks given to participants are more artistic in nature (creating a collage, writing a story), participants are prone to focus more on originality, whereas when participants are given a business problem-solving task they tend to focus on appropriate and useful solutions.

One possible reason task differences are found is because tasks vary in the reactions they generate in participants. As Runco et al. (2005) suggested responses to realistic tasks may be different from responses to unrealistic tasks because of the element of experience. The degree to which a task is novel or draws on experience is one dimension on which tasks may vary. Models of creative thought typically include domain relevant skills, knowledge, or expertise, as one important component, supporting this notion (Amabile, 1996; Mumford & Gustafson, 1988).

However, experience or expertise is only one dimension on which tasks can vary. The degree of perceived complexity of the task may also differentiate among tasks. More complex tasks typically allow for more creativity as they are more ill-defined (Mumford, Mobley, Uhlman, Reiter-Palmon, & Doares, 1991). Ill-defined tasks are characterized by multiple possible goals and solutions (Mumford et al., 1991; Schraw, Dunkle, & Benedixen, 1995), allowing the problem solver to focus on only one goal or multiple goals. In addition, ill-defined tasks may include competing goals. The existence of multiple and possibly competing goals and multiple possible solutions creates more complex problems. Additionally, creative self-efficacy or task self-efficacy has been found to be an important contributor to creative performance (Tierney & Farmer, 2002, 2004). Individuals may vary in the degree to which they perceive the task to be complex or feel they have the necessary ability to solve it.

However, few studies have systematically investigated the role the specific creativity task has on creative performance. When creativity tasks are compared, it is typically across domains where differences between the tasks are obvious and easy to identify (e.g., Conti et al., 1996). For example, it is clear what the differences are between composing music and painting a picture. Further complicating matters, the differences between the tasks are not well documented, particularly in similar domains, such as writing a story or writing a poem. Lubart and Guignard (2004) have suggested that in order to better understand whether creativity is domain specific or general in nature, a better understanding of tasks is needed, however, “this kind of task analysis is essentially missing in the literature and limits our ability to predict creativity in a given task” (Lubart & Guignard, 2004, p. 48).

In this study we have extended the argument of the domain specificity approach by suggesting that just as creative tasks differ between domains (music and writing), they can differ within domains (writing a poem or a short story). However, first we need to understand the characteristics of the tasks and how participants react to these tasks. The first purpose of this paper was to develop a preliminary approach to determining task characteristics as suggested by Lubart and Guignard (2004). The task selected for this study is one commonly used in creativity research, a divergent thinking task involving solving everyday realistic problems. The purpose of the pilot study was to compare three different problems on specific measures on which these problems may differ.

Although realistic divergent thinking tasks may come from different specific content domains, it is important to note that previous studies using these tasks have not evaluated task characteristics. Further, researchers have assumed that different tasks are equivalent and that results generalize across different creative tasks. This assumption, in essence, created a situation where these tasks are de-facto viewed as representing the same domain. Finally, divergent thinking has been viewed as a general process that relates to various creative activities, suggesting that divergent thinking tasks can be used regardless of the specific domain (Baer, 1993; Brown, 1989). Therefore, as a first step, we have used different everyday realistic divergent thinking tasks.

Based on the pilot study, task differences in realistic divergent-thinking tasks used in this study were identified. The main purpose of the study was to determine if task differences may influence performance creative problem-solving. Further, we were interested in determining whether these task differences influence creativity differentially based on the measure or index of creativity used.

Method

Pilot Study – Identifying Task Differences

As suggested by Lubart and Guignard (2004), an understanding of the dimensions on which tasks differ or are similar is necessary. The purpose of the pilot study was to identify some possible dimensions on which tasks may differ. Three different realistic everyday problems were evaluated in the pilot study. The dimensions on which tasks were evaluated were based on a previous study to identify possible task differences and based on the literature relevant to creativity (Scherer, Butler, Reiter-Palmon, & Weiss, 1994; Tierney & Farmer, 2002).

Participants and Measures - Each of the three problems were evaluated by 26 participants. Participants were asked to read the problem and respond to 63 items regarding their reactions to the problem. These items were identified by Scherer et al. (1994) and included nine different dimensions. Forty-two items measured affect using affective semantic differentials on a 6-point scale. Participants indicated which affective word from the pair described how the problem made them feel. Five scales were identified based on a factor analysis by Scherer et al., and are described below.

Elation, included 10 items (item example: depressed-elated) and had a Cronbach alpha of .80. Negative arousal included 17 items (item example: undisturbed-mad) and had an alpha of .91. Fear included four items (item example: afraid-unafraid) with an alpha of .84. Boredom included four items (item example: interested-bored) with an alpha of .81. Finally, positive arousal was measured using four items (item example: tired-energetic) with an alpha of .62.

Four additional scales were measured using the traditional 6-point Likert type response scales and measured other reactions to the problem. Complexity was measured using five items, and had a Cronbach alpha reliability of .86. A sample item is "The problem is complex". Involvement was measured using four items, and had an alpha of .81. A sample item is "Problem affected me personally". Realism/importance was measured using five items, and had an alpha of .80. A sample item is "The problem is very realistic". Finally, problem based efficacy was measured using three items and had a Cronbach alpha of .83. A sample items is "I am very confident I could solve the problem".

Results - Problems selected for this study were designed to reflect different problem characteristics. One problem presented Sally, who feels uncomfortable about her roommate using marijuana. The second problem presented ACME, an organization facing a lack of qualified engineers, decreasing profits, and increased competition for personnel. Finally, the third problem presented Brian, who is supervising his best friend's sister, and she is not performing adequately on the job.

The three problems did not differ in the emotional reactions they elicited from participants based on the scales constructed from the semantic differentials (elation, negative arousal, fear, boredom, and positive arousal). Further, the problems did not differ in the degree of realism/importance ($F(2,77)=.124$, $p=.883$). That is, participants felt that all the problems were realistic and reflected important issues. Means ranged from 4.35 to 4.87 on a 6-point scale, indicating that participants felt that the problems were above the mid-point for realism and importance.

However, the problems did differ on the other three scales. All three problems differed from each other on complexity ($F(2, 77)=25.375$, $p<.01$). The ACME organizational problem was viewed as most complex ($M = 4.74$, $SD = .89$), followed by Brian ($M = 3.88$, $SD = .96$), and finally Sally ($M = 3.08$, $SD = .65$). Problems also differed in the degree to which participants felt involved or felt that the problem mattered to them ($F(2, 77)=5.647$, $p < .01$). The ACME organizational problem was the least involving ($M = 2.59$, $SD =1.0$) and was significantly different from Brian, which was the most involving ($M = 3.47$, $SD = .92$). The degree of involvement for Sally was moderate and did not differ from the two other problems ($M = 3.13$, $SD = .98$). Finally, all three problems also differed in terms of task-based efficacy ($F (2, 77) = 33.334$, $p < .01$). Sally's problem scored highest on the task-based efficacy scale ($M = 5.2$, SD =.74), followed by Brian ($M = 4.35$, $SD = .91$) and ACME had the lowest task-based efficacy ($M = 3.09$, $SD = 1.16$).

As can be seen, all three problems were different in terms of the degree to which participants saw them as complex, the degree in which they felt involved, and in the degree to which they felt confident that they could find a good solution to the problem. The problems did not differ in terms of emotional reactions as measured by the semantic differentials or the degree of realism and importance. Participants viewed the organizational problem faced by ACME as the most complex, had the lowest efficacy, and were also less involved. Participants viewed Brian's problem as the most involving, participants seemed to care most about this problem, or identify with it. Brian's problem also was also viewed as moderate (between the other two problems) in terms of complexity and efficacy. Finally, participants viewed Sally's problem as the least

complex and also one that participants felt that they could solve (higher efficacy). It was moderate in terms of involvement, and did not differ significantly from the other two problems on this scale.

Main Study

Participants

Participants for this study included 187 students enrolled in psychology courses at a Midwestern University, who received extra-credit for their participation. There were 66 males (35%) and 121 females (65%) with a mean age of 22 (*SD* = 5.63).

Measures

Ability. As responses to divergent-thinking tests and creative problem-solving are related to ability (Mumford et al., 1998; Plucker & Beghetto, 2004), a measure of ability was used as a covariate. To evaluate academic intelligence or ability, participants completed the Wonderlic Personnel Test (1988). The Wonderlic is a timed, 12-minute test, designed to evaluate cognitive or general mental ability in normal adults, and is used extensively in the workplace. It includes 50 items measuring both verbal and quantitative ability. The Wonderlic correlates very highly with the WAIS-R (*r*=.92), and test retest reliabilities range from .82 to .94. For the purpose of this study, the score on the Wonderlic was used as a covariate to determine if problem effects were present after taking ability into account.

Problem-Solving Task. Participants were asked to solve one of three ill-defined problems (60-65 participants solved each problem). Problem characteristics are described in the pilot study. Participants were asked to generate as many ideas as they could to the

problem they were presented, and identify the solution that they thought best solved the problem.

Ratings. Solutions to the problems were rated by two trained raters on a 6-point Likert type scale for quality and originality. Because participants generated multiple solutions, each solution was rated independently. Quality was defined as completeness of the solution (is the solution complete and does the solution address multiple issues raised by the problem) and effectiveness (is the solution viable, feasible, practical, appropriate, or legal/ethical). Originality was defined as novelty of the solution (unique approach to the problem), level of imagination (imaginative or humorous approach to the problem), and structure (is the solution limited by the structure of the problem, thinking outside the box). Raters were asked to reach consensus regarding the ratings after they rated each solution independently. Inter-rater agreement was assessed using Cohen's Kappa and was .76 for quality and .69 for originality. Both are acceptable based on the reliabilities found for creativity ratings (Baer, Kaufman, & Gentile, 2004; Cohen, 1960; Landis & Koch, 1977; Mumford, Supinski, Baughman, Costanza, & Threlfall, 1997).

Measure of Creativity. Because each solution was rated separately, and each participant generated a different number of solutions, it was possible to obtain multiple dependent measures for the evaluation of creativity. The first dependent measure used was *fluency*, which was the number of solutions generated by each participant. Fluency is a common measure of creativity for divergent thinking tests or brainstorming tasks, where participants are asked to generate many ideas (Runco, 1999). Utilizing the ratings of quality and originality, several dependent variables were created. The first was that of *average* quality or originality, obtained by averaging the ratings for all solutions

generated by each participant. The second was *proportion* of high quality or high originality solutions. This variable was calculated by determining the number of high quality or high originality solutions (rated 4 and above on a 6-point scale), and dividing by the total number of solutions generated by each participant. The third was that of the total *number of high* quality or high originality solutions. The fourth was that of the *highest rated solution*. For each participant, the highest quality rating and the highest originality ratings were identified and used in the analysis. Finally, each participant has identified what they perceived as the best solution, and the quality and originality ratings of the *participant selected best* were used in the analysis. These multiple measures were created because each measure on its own is contaminated. For example, by looking only at average originality, we may be penalizing those individuals who generated many ideas, and only a few of them are original, compared to those who generated only a few ideas, but more original ones, and did not bother to write down the less original ones.

Results

A total of 11 measures of creativity were used (fluency, average quality and originality, proportion quality and originality, number of high quality and originality, highest rated solution quality and originality, and participant selected best quality and originality). Correlations between the various dependent variables are presented in Table 1. Correlations with fluency suggest that as more solutions are generated, the number of highly rated solutions, for both quality and originality, increases. However, a small negative correlation was observed between fluency and average, as well as fluency and proportion of quality solutions, suggesting that generating more solutions was related to lower quality of the solutions generated. In addition, the five measures of originality

correlated positively and more strongly among themselves than with the quality measures. Most correlations were of medium magnitude (r = .39 to .46). However, number of original solutions was highly correlated with proportion of original solutions (r = .93) suggesting that these two variables measure the same thing. The correlation between the most original solution and average originality and between most original solution and proportion of original solutions were also high (r = .68 and r = .62, respectively). Quality measures correlated more strongly among themselves with correlations ranging from .45 to .91. Some of the variables showed a high level of overlap indicated by the correlations. However, with the exception of a couple of particularly high correlations (.90s), the rest of the correlations showed shared variance ranged from less than 1% to about 45%, indicating that the variables are independent. It was determined, that for the purpose of this paper, it would be best to evaluate the effects of problem type on each variable as a single variable and not as part of a composite score.

Regression was used to determine whether the type of problem had an effect on the creativity measures, after taking ability into account. Ability was entered first as a covariate for all regressions. Because problems differed in terms of difficulty and experience needed, we wanted to make sure that any effects that were found were a result of the problem itself and not the ability of the individual. The score on the Wonderlic was entered first into the equation, followed by the problem, dummy coded. If the increment in R^2 was significant for the problem variables, a Scheffe test was conducted to determine the source of the differences.

Significant effects for problem were found in 9 of the 11 regression analyses conducted (see Table 2). Problem type added 8.8% to the variance accounted for in

fluency above and beyond ability. The Scheffe test revealed significant mean differences between Sally compared to both ACME and Brian (M_{sally} = 5.48, M_{ACME} = 4.08, M_{brian} = 4.02), with participants generating more solutions to Sally's problem (roommate) than to either ACME (organizational problem) or Brian (subordinate problem).

Looking at the various measures of quality, problem type added significantly to the variance explained, above and beyond ability, for all dependent measures (average quality-3.7%, proportion of high quality solutions-6.4%, number of high quality solutions-13.2%, highest quality-5.7%, and participant best-6.1%). A Scheffe test indicated a significant difference between Brian and ACME for the average quality variable, with participants having lower average quality for ACME relative to Brian (M_{ACME} = 2.63, M_{brian} = 3.06). A similar pattern emerged for the variables of proportion of high quality solutions and number of high quality solutions. Participants generated fewer high quality solutions and a lower proportion of high quality solutions to ACME compared with both Brian and Sally (M_{sally} = .48, M_{ACME} = .34, M_{brian} = .49 for proportion, and M_{sally} = 2.38, M_{ACME} = 1.91, M_{brian} = 1.29 for number of high quality). Finally, for both highest quality and participant rated best quality, the Scheffe revealed a significant difference between ACME and Sally, such that quality ratings for ACME were lower than for Sally (M_{sally} = 4.33, M_{ACME} = 3.78 for highest quality and M_{sally} = 3.74, M_{ACME} = 2.91 for participant best). Overall, solutions for ACME reflected lower quality across all measures.

For originality, three of the five analyses showed a significant increment due to problem, after the effects of ability were taken into account (average originality-9.8%, proportion of high originality solutions-9.9%, number of high originality solutions-*ns*,

highest originality-*ns*, and participant best-7.1%). In all cases the Scheffe revealed that the effect is due to responses to Sally being different than the other two problems (Brian and ACME). For average originality, participants had a lower originality score for Sally than the other two problems ($M_{sally} = 3.43$, $M_{ACME} = 4.36$, $M_{brian} = 4.06$). Similarly, for proportion of high originality solutions, participants responding to Sally's problem generated a lower proportion of original solutions relative to Brian and ACME ($M_{sally} = .58$, $M_{ACME} = .79$, $M_{brian} = .75$). Finally, for participant rated best solution, originality for Sally was lower than for the other two problems ($M_{sally} = 2.81$, $M_{ACME} = 3.97$, $M_{brian} = 4.08$).

Discussion

In this study we have compared the results for different creativity indices for three different problems. Problem differed in the degree to which they were viewed as complex, were involving, and the degree of problem-based efficacy indicated by participants. This study revealed that participant creativity was influenced by the type of problem they solved, and that this effect was dependent on the operationalization of creativity, or the specific creativity index used. Further, problem effects were found even after the effects of ability were included in the model, with the variance accounted for ranging from about 4% to over 13%.

Overall, it was found that when a problem is seen as less complex and participants have high problem-based efficacy (Sally's problem in this study), participants tend to generate more solutions (fluency), and less original solutions. When a problem is viewed as more complex, less involving, and participants have lower problem-based efficacy (ACME problem in this study), participants generate lower quality solutions.

The results of this study have several important implications. First, this study suggests that not all real-world, open-ended problems are equivalent. Many studies that utilize these types of tasks to evaluate creativity do not attend to the effect of the specific problem being used, and treat these tasks as reflecting the same domain. As this study suggests, different problems may result in different reactions, which relate to creative performance. These findings provide additional support to the domain specificity approach advocated by Baer (1991, 1998), by showing that even within the same general domain of everyday realistic problems, differences in creativity based on problem differences can be found. Further, as discussed by Baer (1993), the divergent thinking theory of creativity suggests that general skill in divergent thinking underlies creative production across multiple domains. As this study suggests, even within divergent-thinking tasks, differences may emerge due to task characteristics.

Second, this study is one of the first to address the specific issue of problem characteristics as suggested by Lubart and Guignard (2004) and to investigate how reactions to different problems may influence creative problem-solving in a systematic way. This study provides some initial suggestions on some specific problem characteristics that may influence creative problem-solving. In this study we have found that problems differed in terms of complexity, problem-based efficacy, and involvement.

An additional important contribution of this study is that multiple measures of creativity were assessed. The use of multiple measures allowed the comparison of the impact of the problem on different indexes of creativity. Past research has typically evaluated only one aspect of creativity, such as a rating of overall creativity or fluency. In addition, the study evaluated both the generation aspect of creative problem-solving as

well as the evaluation aspect, by looking at both idea generation and asking participants to select their best solution. The results of the study indicate that the type of creativity measure, in addition to the problem characteristics, can influence the outcome of the study.

An intesting finding of this study was that when participants had higher problem based efficacy, that is, participants felt confident that they could solve the problem they generated more solutions, but less original solutions. This finding is somewhat contradictory to previous findings by Tierney and Farmer (2002, 2004). Tierney and Farmer found that creative self-efficacy was positively related to creative performance and job complexity. It is important to note some subtle differences between the two measures of efficacy. The Tierney and Farmer measure focused on general perceptions of creative self-efficacy, that is, did the participant see him or herself as being able to solve problems creatively. It is therefore not surprising that a positive relationship was found between creative self-efficacy and creative performance. In the current study the problem was evaluated, and participants indicated whether they could find good solutions to the problem, not necessarily creative solutions.

Similarly, Tierney and Farmer found that increased job complexity was related to increased creative self-efficacy. In our study the less complex problem had a higher rating on problem based efficacy than the more complex problems. Because the tasks were given to students, who may not have encountered similar problems before, it is not surprising that this relationship was found. It is possible that for the students these familiar problems were viewed as less complex because of their familiarity and the participants were also more confident in their ability to solve these problems because of

their past experience. Tierney and Farmer evaluated job complexity as a predictor of creative self-efficacy, whereas we assessed how problems are evaluated by participants.

Another interesting finding of this study was that the problems did not differ on direct measures of affect (did the problem make you feel happy or sad). On the other hand, problems did differ in the degree of involvement, which has an affective component. It may be the nature of the measure, as the scales measuring affect directly used affective word choices, whereas the other scales asked participants to evaluate their reaction to the problem using descriptive sentences. Alternatively, the influence of affect on these types of problems may be more complex than directly evaluating affective reactions.

Research on the relationship between affect and creativity has found that affect manipulated through gifts, movie clips, or autobiographical recall can influence creative performance (Isen, Daubman & Nowicki, 1987). However, research on the affect creativity relationship has typically not evaluated the effects of affect stemming from engaging in the problem-solving effort. Some research has suggested that engaging in creative problem-solving may generate a positive affective reaction (Amabile, Barsade, Mueller, & Staw, 2005). However, it is unclear whether the affective reaction stems from the task itself, from the process of creative problem-solving, or both. Future research will need to evaluate more fully whether task based affective reactions will have similar effects on creativity as affect manipulations.

When a problem is viewed as complex and problem-based efficacy is low, participants tended to generate fewer solutions and solutions of lower quality. Because we controlled for ability, these differences cannot be attributed to differences in ability,

suggesting that the differences in quality and fluency are a direct result of problem difficulty. The ACME organizational problem indeed depicts a complex business problem, one that most participants, many of whom major in Psychology, do not have the experience or education to solve effectively. These results further support research on expertise and creativity, suggesting that expertise is necessary for effective creative performance, particularly for complex problems (Mumford et al., 1998). Although participants generated fewer solutions and fewer quality solutions to this problem, this was not accompanied by a similar lower level in originality scores, suggesting that fluency and originality may not be related.

Although high problem complexity contributed to fewer solutions and lower quality, the problem that was viewed as the least complex, and that participants felt they had the most ability to solve (Sally, roommate problem), was the one for which participants came up with the least original ideas. This finding provides support to Runco et al.'s (2005) hypothesis that when participants feel that they have experience dealing with a certain type of task, they rely more heavily on that previous experience resulting in less original ideas. Runco et al. provided two possible explanations to their finding that participants provide less original solutions to more realistic problems in their study. One was the effect of realism, whereas the other was the effect of experience. Given that all three problems were viewed as realistic, the findings in this study suggest that experience may play a role in generating original ideas and that possibly more experience resulted in less original solutions.

An alternative explanation may be that, for this particular problem, participants tended to generate solutions that take a specific side. Previous work has found that when

people were emotionally involved and the problem involved their core values, they generated solutions that were less original (Illies & Reiter-Palmon, 2004). The topic of this problem is that of how to handle a roommate that smokes marijuana. As a result, some individuals tended to take a specific side (this is not a big deal vs. doing drugs is wrong and illegal). In this study we did not include an evaluation of this aspect, nor did we evaluate the solutions to determine if this was the case, so this explanation could not be tested directly. Further, this aspect was not addressed by the affective descriptors as the problems were not different in terms of specific affective scales in the pilot study. Future research will have to determine whether emotional involvement or value involvement influence creative problem-solving.

Future research should map additional tasks on these task characteristics to determine whether differences in these dimensions indeed result in differences in creative production. Further, additional dimensions may be needed to fully describe the problems. One such dimension, taking sides or being objective, was identified here, and should be added to the way tasks are evaluated. Finally, this study evaluated three problems that differed in terms of three dimensions. No attempt was made in this study to isolate these dimensions and evaluate the effect of each task dimension on creativity. Future research should evaluate not only additional dimensions, but also attempt to isolate the effects of each dimension of creative performance.

After a complete set of descriptors of problem characteristics are identified, future researchers in this area may want to determine how problem characteristics exert their influence on creative production. For example, it is possible that high problem-based efficacy and perception of low complexity create a situation in which minimum attention

is given to problem definition and construction. This in turn may lead to simpler problem definitions, simpler goals, and lack of attention to restrictions, which will lead to lower creativity (Mumford, Baughman, Threlfall, Supinski, & Costanza, 1996). Additionally, in this study, the most complex problem also had the lowest participant efficacy. It is possible that one or both of these increase critical evaluation of the solutions and therefore resulted in fewer ideas written by participants. Critical evaluation of the solutions would result in fewer ideas written, although the participants may have had just as many ideas as participants who solved the other problems. Given that we can only evaluate what the participants were willing to put down on paper, we cannot directly test this hypothesis. Even with these limitations, this study provides a meaningful start on identifying reliable and meaningful dimensions on which realistic divergent-thinking problems may differ, and provides support for the domain specificity approach. In addition, this study provides a first step in determining whether these task difference influence creativity.

References

Amabile, T. M. (1996). *Creativity in context: Update to "The social psychology of creativity."* Boulder, CO, Westview Press.

Amabile, T. M., Barsade, S. G., Mueller, J. S., & Staw, B. M. (2005). Affect and creativity at work. *Administrative Science Quarterly, 50,* 367-403.

Baer, J. (1991). Generality of creativity across performance domains. *Creativity Research Journal, 4,* 23-39.

Baer, J. (1993). *Creativity and divergent thinking: A task specific approach*. Hillsdale, NJ: Erlbaum.

Baer, J. (1996). The effects of task-specific divergent-thinking training. *Journal of Creative Behavior, 30,* 183-187.

Baer, J. (1998). The case for domain specificity of creativity. *Creativity Research Journal, 11,* 173-177.

Baer, J., & Kaufman, J. C. (2005). Bridging generality and specificity: The amusement park theoretical (APT) model of creativity. *Roeper Review, 27,* 158-163.

Baer, J., Kaufman, J. C., & Gentile, C. A. (2004). Extension of the consensual assessment technique to nonparallel creative products. *Creativity Research Journal, 11,* 113-118.

Cohen, J. (1960). A coefficient of agreement for nominal scales. *Psychological Measurement, 20,* 37-46.

Conti, R., Coon, H., & Amabile, T. M. (1996). Evidence to support the componential model of creativity: Secondary analyses of three studies. *Creativity Research Journal, 9,* 385-389.

Feist, G. J. (1998). A meta-analysis of personality in scientific and artistic creativity. *Personality & Social Psychology Review, 2*, 290-309.

Illies, J. J. & Reiter-Palmon, R. (2004). The effects of type and level of personal involvement on information search and problem solving. *Journal of Applied Social Psychology*, *34*, 1709-1729.

Isen, A. M., Daubman, K. A., & Nowicki, G. P. (1987). Positive affect facilitates creative problem solving. *Journal of Personality and Social Psychology, 52,* 1122-1131.

Kaufman, J. C. & Baer, J. (2004). Hawking's haiku, Madonna's math: Why it is hard to be creative in every room of the house. In R. J. Sternberg & E. L. Grigorenko (Eds.), *Creativity: From potential to realization* (pp. 3-19). Washington, DC: American Psychological Association.

Landis, R. J. & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics, 33*, 159-174.

Lubart, T. & Guignard, J. (2004). The generality-specificity of creativity: A multivariate approach. In R. J. Sternberg & E. L. Grigorenko (Eds.), *Creativity: From potential to realization* (pp. 43-56). Washington, DC: American Psychological Association.

Mumford, M. D., Baughman, W. A., Threlfall, V. K. Supinski, E. P., & Costanza, D. P. (1996). Process-based measures of creative problem-solving skills: Problem construction. *Creativity Research Journal, 9*, 63-76.

Mumford, M. D. & Gustafson, S. B. (1988). Creativity syndrome: Integration, application, and innovation. *Psychological Bulletin, 103*, 27-34.

Mumford, M. D. Marks, M. A. Connelly, M. S., Zaccaro, S. J., & Johnson, J. F. (1998). Domain-based scoring in divergent-thinking tests: Validation evidence in an occupational sample. *Creativity Research Journal, 11*, 151-164.

Mumford, M. D., Mobley, M. I., Uhlman, C. E., Reiter-Palmon, R., & Doares, L. M. (1991). Process analytic models of creative capacities. *Creativity Research Journla, 4*, 91-122.

Mumford, M. D., Supinski, E. P., Baughman, W. A., Costanza, D. P., & Threlfall, V. K. (1997). Process-based measures of creative problem-solving skills: V. Overall prediction. *Creativity Research Journal, 10*, 73-85.

Plucker, J. (2005). The (relatively) generalist view of creativity. In J. C. Kaufman and J. Baer, (Eds.), *Creativity across domains: Faces of the muse* (pp. 307-312). Mahwah, NJ: Erlbaum.

Plucker, J. A. & Beghetto, R. A. (2004). Why creativity is domain general, why it looks domain specific, and why the distinction does not matter. In R. J. Sternberg & E. L. Grigorenko (Eds.), *Creativity: From potential to realization* (pp. 153-167). Washington, DC: American Psychological Association.

Runco, M. A. (1999). Divergent thinking. In M. A. Runco & S. R. Pritzker (Eds.). *Encyclopedia of creativity* (Vol. 1, pp. 577-582). San Diego, CA: Academic Press.

Runco, M. A., Illies, J. J., & Eisenman, R. (2005). Creativity, originality, and appropriateness: What do explicit instructions tell us about their relationships? *Journal of Creative Behavior, 39,* 137-148.

Scherer, L. L., Butler, A. B., Reiter-Palmon, R., & Weiss, R. J. (1994). *Toward a taxonomy of reactions to ill-structured problems*. Paper presented at the annual meeting of the Society for Judgment and Decision Making, St. Louis.

Schraw, G., Dunkle, M.E., & Benedixen, L.D. (1995). Cognitive processes in well-defined and ill-defined problem solving. *Applied Cognitive Psychology, 9,* 523-538.

Tierney, P. & Farmer, S. M. (2002). Creative self-efficacy: Its potential antecedents and relationship to creative performance. *Academy of Management Journal, 45,* 1137-1148.

Tierney, P. & Farmer, S. M. (2004). The Pygmalion process and employee creativity. *Journal of Management, 30,* 413-432.

Weisberg, R. W. (1999). Creativity and knowledge: A challenge to theories. In R.J. Sternberg (Ed.), *Handbook of creativity* (pp. 226-250). New York, NY: Cambridge University Press.

Wonderlic, (1988) *Wonderlic personnel test*. Libertyville, IL:Wonderlic Personnel Test Inc.

Yuan, F., & Zhou, J. (2002). *Expected evaluations and creativity: New answers to an old question*. Paper presented at the meetings of the Academy of Management, Denver CO.

Table 1
Intercorrelations among Dependent Variables

	2	3	4	5	6	7	8	9	10	11
1. Fluency	-.039	.30**	-.031	.85**	-.00	-.038	.20**	-.188**	.476**	-.156*
2. Originality Participant best	1.0	.409**	.413**	.133	.401**	-.069	.075	.051	-.014	-.032
3. Originality highest		1.0	.682**	.457**	.625**	.124	.308**	.096	.175*	-.009
4. Originality average			1.0	.395**	.935**	.079	.017	.049	-.149*	-.074
5. Originality Number of high				1.0	.453**	-.022	.155*	-.179*	.309**	-.194**
6. Originality Proportion of high					1.0	.066	.074	.064	-.112	-.071
7. Quality Participant best						1.0	.56**	.62**	.449**	.604**
8. Quality highest							1.0	.918**	.635**	.66**
9. Quality average								1.0	.579**	.918**
10. Quality Number of high									1.0	.66*
11. Quality Proportion of high										1.0

$N = 187$
* $p < .05$, ** $p < .01$

Table 2

Summary of Regression Analyses for Variables Predicting Creativity Indices

Variable	R^2	R^2 Change	Beta
Fluency			
Step 1	.09**	.09**	
Wonderlic			.30**
Step 2	.18**	.09**	
Wonderlic			.31**
Problem 1			-.14
Problem 2			.20**
Average Quality			
Step 1	.01	.01	
Wonderlic			.09
Step 2	.04*	.04*	
Wonderlic			.11
Problem 1			.17*
Problem 2			.21*
Highest Solution Quality			
Step 1	.05**	.05**	
Wonderlic			.22**
Step 2	.11**	.06**	
Wonderlic			.24**
Problem 1			.12
Problem 2			.28**
No. of High Quality			
Step 1	.03*	.03*	
Wonderlic			.16*
Step 2	.16**	.13**	
Wonderlic			.19**
Problem 1			.03
Problem 2			.38**

Variable	R^2	R^2 Change	Beta
Proportion High Quality			
Step 1	.00	.00	
Wonderlic			.06
Step 2	.07**	.06**	
Wonderlic			.08
Problem 1			.16
Problem 2			.30**
Participant Best Quality			
Step 1	.00	.00	
Wonderlic			.02
Step 2	.06*	.06**	
Wonderlic			.04
Problem 1			.07
Problem 2			.27**
Average Originality			
Step 1	.04**	.04**	
Wonderlic			.20**
Step 2	.14**	.10**	
Wonderlic			.20**
Problem 1			.08
Problem 2			-.26**
Highest Solution Originality			
Step 1	.11**	.11**	
Wonderlic			.33**
Step 2	.12**	.01	
Wonderlic			.32**
Problem 1			.02
Problem 2			-.11
No. of High Originality			
Step 1	.10**	.10**	
Wonderlic			.32**
Step 2	.11**	.00	
Wonderlic			.32**
Problem 1			-.03
Problem 2			.05

Variable	R^2	R^2 Change	Beta
Proportion High Originality			
Step 1	.04**	.04**	
Wonderlic			.20**
Step 2	.14**	.10**	
Wonderlic			.19**
Problem 1			.13
Problem 2			-.23**
Participant Best Originality			
Step 1	.05**	.05**	
Wonderlic			.23**
Step 2	.13**	.07**	
Wonderlic			.23**
Problem 1			.19*
Problem 2			-.11

Note. * p<.05, **p<.01
N=187